CONVERTIBLE BOND CALL, CALL DELAY, AND THE VALUE OF CALL UNDERWRITING

BY

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This dissertation focuses on three facets of convertible bond call: the market's reaction to call announcements and its explanation, motivations for call delay, and the role and the value of underwriting convertible bond calls. The proxy of change in average income growth is found positively related to the market's reaction, a result consistent with the information/signalling hypothesis. However, this result is sensitive to the method of computation chosen for changes in income growth. The difference between the after-tax coupon and the dividend yields on a convertible bond is found negatively related to market's reaction, a result consistent with the free cash flow hypothesis. These two results and their interpretations have not previously been documented. Thus this study adds new evidence to the literature.

The results of testing the financial distress hypothesis and call delay are somewhat obscure. Call premium is found positively related to the market's reaction, a result consistent with the notion of potential financial distress on an ex post basis, but not with the prediction of the financial distress hypothesis. The proxy for financial leverage is found negatively related to call delay measured by the call premium. The (scaled) amount of liquid assets is found positively related to call delay. However, the negative association between the financial leverage proxy and call delay seems to suggest that convertible debt may serve as a "buffer" between straight debt and equity in corporate financing.

Though not found significant in the regression model explaining the market's reaction, the presence of a call underwriter does cause more negative market response when the sample are partitioned into underwritten and non-underwritten calls. However, no evidence is found to prove the signalling content of underwritten calls. No evidence is found to support that firms employing an underwriter perform worse than the ones that do not employ one. Careful examination of the data reveals that firms employing an underwriter are more likely to succeed in the conversion, thus making the underwriting contract seemingly unnecessary and sub-optimal. This finding conflicts with the explanation based on the signalling content of the underwriting contract. Rather, it indicates imprudent management.

CHAPTER 1
INTRODUCTION

Convertible bonds are unique due to their hybrid characteristic of "half debt and half equity." When first issued, a convertible bond pays interest on a regular basis. However, bondholders are given an option to exchange the bonds for common shares of the same firm (or sometimes, its subsidiary) at a pre-specified exchange rate. The pre-specified exchange rate (known as the conversion ratio) is usually expressed as the number of shares into which one bond can be converted. The quotient of the bond's face value and the conversion ratio is the implicit price per share of the conversion.

Conversion value is the worth of the shares after the conversion valued at the prevailing stock price. For example, if the face value of each convertible bond is $1,000 and the conversion ratio is 50, the implicit price of conversion is $20 per share. If the current stock price is $25, the conversion value will be $1,250.

When the bond is first created, the conversion value is typically lower than the bond's market value (price).[1] The bond (and the conversion option) is said to be "out of the money," since converting to stock results in a loss to the bondholders.[2] A bond is "in the money" if the conversion value is higher than the bond price.

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[1] The market value is often the face value when the bond is issued.

[2] This is from the perspective of bondholders. Looking from the issuer's perspective, the conversion value should be compared to the call price rather than the bond price, to determine whether the bond is in-the-money or out-of-the-money.

The call provision on a convertible bond gives the issuer the right to buy back the bond at the pre-specified call price. The right to call is undoubtedly a valuable option to the issuer.[3] When a convertible bond is called, bondholders are usually given a thirty-day (sometimes longer) notice period. Bondholders have two options through the notice period. They may convert the bonds or return them to the issuer for cash. The amount of cash is the call price plus any accrued interest. Since the value from one of these two choices is higher than the other one, and since rational bondholders choose the option giving them the higher value, a bond is either entirely converted or returned for cash. If bondholders choose to receive cash, it is called a redemption since the bond is not converted.

A forced conversion occurs after the bond is called. A voluntary conversion occurs without the bond being called. From the viewpoint of the issuing firm, voluntary conversions are cheaper than forced conversions because the issuing costs and the stock price decline associated with a call are avoided.

Shareholders pay attention to the call policy of the issuing firm because their stock values are affected by the call announcements. Hence, it is important for the shareholders to understand the factors affecting the call decision. The market's reaction towards announced calls has been the focus of several studies. These studies are reviewed and criticized in detail in Chapter 2. In general, all of these studies report a negative market response in the common stock to announcements of convertible bond calls. Nevertheless, no study so far is able to offer consistent and satisfactory explanations.

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[3] A call protection period may apply to the call provision. If such restriction exists, it will be specified in the indenture.

Another interesting and related issue is the optimal call strategy of the issuing firm. In an environment of perfect and frictionless markets, a reasonable rule for the issuing firm seems to be "call when the conversion value just exceeds the call price." However, several studies report delays in calls until the conversion value is much larger than the call price. Several hypotheses are offered and tested by previous studies to explain the apparent call delay. However, none of these explanations can fully account for the call delay phenomenon.

This study focuses on three facets of convertible bond call:

(1) the market's reaction to call announcements and its explanation,

(2) examine the issue of call delay, and

(3) the role and the value of underwriting convertible bond calls.

To better explain the market's reaction, five hypotheses are formed and tested, namely, the information-signalling, the underwriter, the yield difference, the free cash flow, and the financial distress hypotheses. Some of these hypotheses have been previously tested (or "partially" tested) while some have not. For instance, the information-signalling hypothesis was tested in a previous study but the employed methods and the accuracy of the data are questionable (discussed later). The underwriter hypothesis was tested and the result is inconclusive. The yield difference, the free cash flow, and the financial distress hypotheses have not been tested. For the issue of call delay, the focus is whether financial distress may have contributed to call delay. One solution to avoid financial distress if conversion fails is to employ an underwriter, which is also carefully examined in this dissertation.

Therefore, this dissertation has two main contributions. First, it examines the hypotheses with better data and more consistent methods, representing improvement on the existing studies. Second, it tests several new hypotheses, thus adding new evidence to the literature.

This dissertation is organized as follows. Chapter 2 provides a thorough review and critique of the related literature fundamental to the theme. Hypotheses to be tested are also stipulated. Chapter 3 describes data sources and the sample selection process, explains the research methodology in detail. Research result is presented in Chapter 4. Chapter 5 concludes the study and suggests passages of future research.

CHAPTER 2
REVIEW OF LITERATURE AND HYPOTHESES

2.1 Review of Literature

Section 2.1 provides a review of the related literature. The review is divided into two subsections according to their main focuses. The first subsection (2.1.1) reviews studies dealing with the market's reaction towards announcements of convertible debt calls, and the interpretations of the reaction. Subsection 2.1.2 reviews studies focusing on the delay of convertible calls, the motivations and possible explanations for such delay.

2.1.1 Work Related to Market's Reaction Towards Call Announcements

Mikkelson (1981) examines the impact of convertible bond calls on security holder's wealth. He finds that common stock values fall by approximately two percent on average at the announcement of convertible debt calls, but common stockholders' wealth is unaffected by convertible preferred stock calls. Mikkelson attributes the decline in firm value to a corporate tax effect, namely, the loss of interest expense tax shields. Mikkelson's finding raises, but leaves unanswered, the interesting question of what motivates managers to make capital structure decisions that reduce stockholder wealth and firm value.

Harris and Raviv (1985) (HR hereafter) constitute the most complete theory in the field. Relying on asymmetrical information, HR rationalize the wealth effect and call delay. According to HR, the call decision is entirely motivated by private information on a company's prospect. Favorable prospect is tied to higher future equity price, induces voluntary conversions by the bondholders, and vise versa. In HR's model, voluntary conversion is a less expensive alternative than cash redemption. Hence, the manager' decision to call signals unfavorable prospect and the common stock value falls with the call announcement. Call delay is a result of continuous favorable prospects. Mikkelson's finding is consistent with HR's theory.

Ofer and Natarajan (1987) is the most complete study empirically testing HR's theory. Explicitly, they examine the information content of convertible bond call announcements. Their tests are conducted to answer two questions: the motivation behind the call decision and the market's reaction to call announcements.[1]

Ofer and Natarajan report an *average* cumulative excess return of -1.7% over the five-gay period from day -1 to day +3 with the announcement day being day 0. So the market reacts negatively to call announcement. They conclude that the significant negative market reaction supports the hypothesis of signalling unfavorable information about the firms' prospect through the call announcement (page 103).

Furthermore, Ofer and Natarajan find unexpected declines in performance (gauged by earning-related measures) up to five years following the call announcements. They contend that convertible bond calls are motivated by unfavorable, private information.

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[1] These two questions are treated as independent issues, and the empirical tests are conducted separated. Unfortunately, this is actually a deviation from HR's notion where these two issues are interactive.

Combining these two results, Ofer and Natarajan conclude that their results support the information-signalling hypothesis (page 105) postulated by Harris and Raviv.

The major drawback of Ofer and Natarajan's study is that market's reaction and post-call corporate performance are examined separately. They make no attempt to link the two. In HR's model, convertible bond calls signal negative information only, and the market's reaction is directly related to the signal's content. Hence, a more negative information should induce worse market reaction than a information of lesser negativity. If the negative information materializes later, it should appear in corporate earnings. As a result, corporate earnings (performance) should be consistent with the magnitude of market's reaction interpreting the call announcement as a signal. This is the essence of HR's model where market's reaction and the information content issues are resolved simultaneously. However, this essential point is missing from Ofer and Natarajan.

In addition, the methodology used in Ofer and Natarajan suffers the following flaws. Firstly, companies announcing other news during day -1 and day +3 were not excluded from their study. This affects the "validity" of the excess return measurement. In fact, Ofer and Natarajan report that the average standardized excess return on day +1 (the day *following* the call announcement) is significant at the 0.01 level and "more than twice" the size of the same statistics on any of the other forty days[2] (page 103). While it is impossible to explain why the investors react to the call announcement on day +1, the excess return on day +1 is probably reactions to *other* news announcements during the 5-day period surrounding the call.[3]

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[2] From day -20 to day +20.

Secondly, Ofer and Nartarajan use pre-call stock returns (day -80 to day -21) to measure the parameter in the "market model" in computing the excess returns. Equity prices usually rise after issuance since this is a necessary condition for the bonds to be converted, pre-call returns tend to bias the estimated parameters in the market model upwardly, resulting in downward bias in abnormal returns.[4] Indeed, Ofer and Natarajan report significant negative cumulative excess returns *subsequent* to the calls, a disturbing occurrence in an efficient financial market. They conclude that the market is possibly inefficient (page 105), but acknowledge the possibility that they may have over-estimated the "normal rate of return for these securities during the period after the call."

A third problem in Ofer and Natarajan's technique is about the three adopted measures of performance (by income growth): earnings before interest and taxes (EBIT), earnings before taxes (EBT), and earnings per share (EPS). Of these measures, EBIT is not affected by the conversion. However, EBT is affected by the reduction in interest payment, and EPS is affected by both the reduction in interest payment and the increased number of shares outstanding. This study avoids this problem by adopting measures not affected by the conversion.

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[3] An selective examination of the sample reveals that of the 25 call announcements in 1978 and 1979, 13 companies announced other corporate news during the 5-day period surrounding the call announcement day.

[4] See Mikkelson, and especially, Campbell Ederington, and Vankudre (1991) for an argument of this point.

Constantinides and Grundy (1987) examine the information content of call announcements. They test the "tax advantage" hypothesis, which views the negative stock price response to a call announcement as a reflection of the loss of a valuable tax shield. Constantinides and Grundy find the smaller the size of the tax shield (measured by the ratio of the face amount of the bond outstanding when called relative to total firm value), the smaller the stock price reaction to the call. However, this finding is consistent with either the "tax advantage" hypothesis, or the signalling hypothesis based on information asymmetry, i.e., call reveals insider information to the market.

When Constantinides and Grundy employ two additional variables (discussed shortly) to separate the tax and information effects, the coefficient on the "tax advantage" hypothesis becomes insignificant. Constantinides and Grundy conclude that stock price declines accompanying call announcements reflect the release of new information about the firm's prospects rather than the loss of a valuable tax-shield.[5]

One significant drawback of Constantinides and Grundy lies in the two additional variables used to separate the tax and information effects. The two variables are the fraction of the original issue still outstanding at the time of the call, and the yield advantage on the bond (i.e., the difference between the annual coupon and the yearly dividend to be received upon conversion. Constantinides and Grundy's result shows that the fraction of the original issue still outstanding at the time of the call to be the only significant variables. Their conclusion of supporting the information effect is based solely on this variable, which says nothing about the private information corporate insiders possess regarding the prospects of the firm.

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[5] Constantinides and Grundy also test a hypothesis based on a prediction in Harris and Raviv (1985) where a more negative stock price response is expected if the convertible is in-the-money and remains uncalled for a longer time period. The test result does not support this hypothesis.

Cowan, Nayar, and Singh (1991) (CNS hereafter) also examine the market's reaction to convertible bond calls. CNS find that the negative common stock return is confined to underwritten calls.[6] Non-underwritten calls exhibit no significant effect on common equity prices. CNS conclude that their finding is consistent with HR's theory because companies hiring an underwriter have more negative information regarding the firms' prospect (page 194). In other words, equity prices are more likely to fall (i.e., conversion is less likely) with underwritten calls than with non-underwritten ones.

CNS's result is significant in two aspects. First, it represents a refinement from Mikkelson (1981) and Ofer and Natarajan (1987) where the conclusion of negative stock returns applies to an average firm in the sample, regardless of the characteristics of the call. Second, it disputes, to a great extent, the implication of the model by Harris and Raviv where the market is supposed to react uniformly negatively upon call announcements because the call signals unfavorable private information. However, there are two unresolved issues in CNS. First, the matter of underwriting convertible bond calls never appeared in HR's model, which CNS claim to be the theoretical rationale for their result. Second, CNS fail to provide convincing arguments and/or evidence about why equity price should drop more on underwritten calls. This study re-examines the market's reaction to a sample of underwritten and non-underwritten calls in great detail, and offers an alternative (and probably more accurate) explanation about the negative equity price reaction to underwritten calls.

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[6] A typical underwriting contract involves a standby purchase agreement where the underwriter (usually a syndicated group of investment bankers) offers to purchase the bond at a price slightly higher than the effective call price. The underwriter also agrees to convert into common shares all the bonds purchased. Thus, the conversion becomes a sure thing under such agreement. In turn, the firm pays a fee to the underwriter for taking the risks that the stock price may fall during the notice period and the underwriter suffers a loss.

Campbell, Ederington, and Vankudre (1991) (CEV hereafter) compare the post-call performance between samples of calling firms and non-calling firms that have convertible outstanding. CEV find that earnings growth rates of the calling firms to be somewhat lower than those of their non-calling counterparts, but remain significantly positive after the call. This finding is not totally supportive of Harris and Raviv's prediction.

In summary, while the market's reacts more negatively to the presence of a standby purchase contract, whether such presence is a precursor of unfavorable information about the firms remains questionable. In fact, no study result is available to fully support this proposition. Table 1 illustrates the hypotheses, data, research methods of some of the studies discussed in this section.

2.1.2 Work Related to Call Delay

Ingersoll (1977) is the first study examining the issue of "call delay" of convertible debt. An optimal call policy is derived under the perfect market assumption. Under this assumption, a firm is expected to call its outstanding convertible debt as soon as the bond is "at the money," namely, when the conversion value is equal to the call price. Nevertheless, Ingersoll finds that "the median company waited until the conversion value of its debenture was 43.9 percent in excess of the call price."

Table 1: Summary of Studies of Market's Reaction to Convertible Call Announcement

	Ofer and Natarajan (1987)	Constantinides and Grundy (1987)	Cowan, Nayar, and Singh (1991)
Data	1971-1980	1971-1981	1968-1983
Method	(1) Measuring abnormal stock returns when bond is called; (2) Measuring corporate performance after the call.	(1) Measuring abnormal stock returns when bond is called; (2) Regress 2-day abnormal stock returns against proxies for "tax" and "information" effects.	Measuring abnormal stock returns when bond is called, and dividing the sample into underwritten and non-underwritten calls.
Hypotheses	The information-signalling hypothesis: call decisions are made based on private information. Namely, call when managers receive bad news. This hypothesis is first provided by Harris and Raviv (1985).	(1) The tax advantage hypothesis: the negative stock price response to a call announcement as a reflection of the loss of a valuable tax shield. (2) The information asymmetry hypothesis: the call signals corporate manager's estimate of future dividend of the firm, and the market reacts to this signal.	(1) The agency-cost hypothesis: The use of underwriters is collusion between managers and underwriters to benefit themselves at the expense of shareholders. This hypothesis is first provided by Smith (1977). (2) The shareholder wealth maximization hypothesis: The use of underwriters is beneficial to shareholders if its benefit justifies its cost. This hypothesis is based on Heinkel and Schwartz (1986).
Hypotheses supported by the results?	Yes, but concludes market inefficiency, which is proved to have suffered from estimate errors.	Only the information asymmetry hypothesis is supported, but the result may have suffered from mis-specified proxies for the "information content" of the call.	No, the results do not support either hypothesis.

Ingersoll then tests whether the call delay can be explained by "imperfections" in the financial market. Two imperfections examined are transaction costs (e.g., the underwriting cost of reissuing new debt), and the typical 30-day notice period. However, the two market imperfections are found to have only a marginal effect on the optimal call policy.

Constantinides and Grundy (1987) relate call delay to the "yield advantage" on the convertible bond. Constantinides and Grundy measure the yield advantage on a bond as the difference between the current annual coupon and the yearly dividend to be received upon conversion of $100 face amount of the bond. The "advantage" to the firm is the saving for not calling the bond, i.e., to pay interest, instead of paying dividends on newly issued shares on the conversion.

Constantinides and Grundy's yield advantage hypothesis has two predictions. First, it predicts that bonds with the coupon lower than the dividend (a negative yield advantage) are not called. Second, it predicts that bonds with the coupon higher than the dividend (a positive yield advantage) are more likely to be called the smaller the probability that the yield advantage will become negative. In general, the yield advantage hypothesis predicts a positive association between the yield advantage and the probability of a call. Constantinides and Grundy use a probit model to estimate the probability of call. Their results confirm the prediction of the yield advantage hypothesis that the greater the yield advantage the higher the probability of a call.

Jaffee and Shleifer (1990) are the first to suggest the possibility that costs of financial distress may affect the decision and outcome of convertible bond calls. Relying on the notion that corporate managers are risk-averse, costs of financial distress may represent a significant threat to the management. As a first step, Jaffee and Shleifer challenge the importance of "yield advantage" in the decision process of convertible bond calls. The authors contend that the size of the costs of delaying the call, excluding costs of financial distress, are small. Jaffee and Shleifer use the following example (page S109) to illustrate this point.

Let the convertible issue of a hypothetical firm be 15% of its market equity value. In fact, this figure is based on Dann and Mikkelson (1984). Also, suppose the (pre-tax) yield on the convertible bond is 6% more that on the corresponding stock, an unusually high number. If the delay is an average 2 years (based on Constantinides and Grundy), and the marginal corporate tax rate (before 1986) is 46%, then the firm would lose approximately 3% per annum as an opportunity cost for not calling the bond on an after-tax basis. In this instance, over the two-year period the firm would lose 15% times 3% times 2 (years), or 0.9%, a small portion of its equity value for delaying the call.

However, the really important point with the yield advantage hypothesis is the flip side of the same example, a scenario Jaffee and Shleifer did not consider. Let all figures in the above example remain the same except that the yield of the bond is 6% lower than that of the stock. As a result, the firm saves 6% (or 3% on an after-tax basis) per year for delaying the call. The benefit the firm gets is again 0.9% of its equity, a small amount.

The latter example is of more importance. Interest that can be saved from the combination of a higher yield on dividend and delaying the call is greatly reduced by corporate taxes. After corporate taxes, the saving from delaying the call is small unless the pre-tax difference in the two yields (of bond and stock) is quite large. Since the size of the difference in yields of the bond and stock is small, the call decision should not be significantly related to yields.

However, this point is not acknowledged by Jaffee and Shleifer as they state in Section IV (Implications): "Any reasonable theory of delayed conversion *must be* consistent with the . . . hypothesis that the incentives for forcing conversion are positively related to the yield advantage." Nevertheless, their effort to build costs of financial distress into the decision of convertible bond calls provides useful insights into the current theory on this subject.

In Jaffee and Shleifer's model, an unexpected failed conversion may create costly financial distress since the firm must raise new capital to finance the redemption of bonds. Two equilibria exist: the forced conversion succeeds if bondholders expect it to succeed and fails if bondholders expect it to fail. The intuition behind the model is the following.

Assume no notice period. The firm follows the strategy of calling the bond when it is just at the money (Ingersoll 1977). If bondholders expect the conversion to succeed, they convert to stock, the firm's value is not affected, and conversion indeed succeeds. In contrast, if bondholders expect conversion to fail, they expect the fundamental value of the firm to fall reflecting the costs of financial distress. The firm's stock price then falls to justify the decline of its fundamental value so that the bond, which is initially at the money, falls out of the money. Bondholders then rationally redeem their bonds for cash, and the conversion indeed fails, justifying the depressed price of the stock.[7]

As a result, if managers are averse to financial distress, a natural response is to delay the call until stock price rises sufficiently to ensure that the bond remains in the money. Rational bondholders then expect the forced conversion to succeed, and it surely succeeds. Hence, the most important implication of Jaffee and Shleifer's model is a positive association between the costs of financial distress and call delay. However, it should be acknowledged that this implication does not seem to be directly related to their model itself.

Furthermore, Jaffee and Shleifer's study also sheds light on the use of the standby purchasing contract offered by an investment banker in forced conversions. Uncertainty arises from the typical 30-day notice period during which the price of the underlying stock may fall, causing the forced conversion to fail. A reasonable solution to the uncertainty seems to be employing an underwriter. However, Jaffee and Shleifer maintain that the standby-contract schemes do not resolve all the uncertainty facing the firm. This point is discussed further in Section 2.2.5. Table 2 illustrates the hypotheses, data, research methods of some of the studies discussed in this section.

2.2 Hypotheses

This section describes in detail the hypotheses which will be empirically tested in this dissertation. These hypotheses aim at two issues: (1) stock market's reaction towards

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[7] Such equilibria in the model are similar to those in Diamond and Dybvig's bank runs (1983), of which the source of the panic is not entirely clear (e.g., the source could be the observation of a sunspot).

Table 2: Summary of Studies Investigating
"Why convertible calls are delayed?"

	Harris and Raviv (1985)	Constantinides and Grundy (1987)	Jaffee and Shleifer (1990)
Data	No	1971-1981	No
Method	Theoretical derivation	Using probit model to estimate the probability of a bond being called, and identifying factors affecting the probability of a call.	Theoretical derivation
Hypotheses	The information-signalling hypothesis: Call decisions are guided by private information regarding the firm's prospects. If this information is positive, managers do not call since voluntary conversion is likely. Managers call when receiving negative information. The market realizes this and adjusts stock prices accordingly.	The yield advantage hypothesis predicts, in general, a positive association between the current yield advantage on a bond and the probability that the bond will be called in the near future.	Costs of financial distress: this hypothesis asserts that firms delay the call to avoid potential financial distress induced by a sudden drop in stock price during the notice period. Bondholders redeem instead of convert. This situation causes distress because the firm must raise capital in short notice to meet the redemption.
Hypotheses supported by the results?	————	Yes	————

announcements of calls of convertible debt, and (2) link between call delay and firm-specific characteristics.

A preliminary sample reveals mixed market reaction to call announcements. The calculated abnormal returns vary across firms with some positive, some negative, and some not different from zero (to be discussed in detail in Chapter 3). In the existing theory (especially, Harris and Raviv 1985), the market's reaction is supposed to be only negative by the theory of Harris and Raviv.

2.2.1 The Information-Signalling Hypothesis

This hypothesis can be regarded as the combination of two separate hypotheses, the information hypothesis and the signalling hypothesis. The information hypothesis postulates that convertible calls are motivated by unfavorable prospects of the calling firm. In the signalling hypothesis, the market perceives the call as a signal of bad news of the firm and reacts negatively. In Harris and Raviv (1985), the information and the signalling hypotheses are considered simultaneously and an equilibrium exists.

If the call itself reveals private information to the market, that information should be fully incorporated into the price at the time of the call in an efficient market. In Harris and Raviv, the nature of such information is always negative (discussed earlier). So the market should react negatively. The more negative the information is perceived, the more negative the stock return is. Hence, the information-signalling hypothesis predicts a positive association between the market's reaction and the financial performance (corporate earnings) of the calling firm after the call. This *direct* link between the market's reaction and the post-call performance has not been established in the literature.

2.2.2 The Yield Difference Hypothesis

This hypothesis is an extension of the "signalling" hypothesis but deals with the "costs" of debt and equity to the firm. According to Constantinides and Grundy's yield advantage argument, the difference in cost between the interest and the dividend affects the call decision (and the market's reaction). Due to the tax deductibility of interest payment, the calling firm and the market compare the after-tax cost of interest with the dividend payment when making their decisions. Define the after-tax interest minus the current dividend as the *yield difference*[8] of a convertible. Since the manager possesses private information on the firm's prospect (e.g., dividend growth forecast), if the market believes the call conveys inside information and reacts accordingly, the 2-day abnormal returns may contain a component representing the private information conveyed.

According to Constantinides and Grundy (discussed earlier), if a convertible bond is called when its dividend yield is higher (i.e., a negative yield difference), it is a credit signal of negative insider news. This is because the higher current dividend yield is likely to induce voluntary conversion (provided that the conversion value is also higher, which is the case for most of the firms in the sample). Since voluntary conversion is a cheaper alternative to forcing the conversion, a called convertible with a higher dividend yield signals possible decline in future dividend, and serves as a credible signal of negative insider information. A call made under a higher bond yield is not a credible signal of unfavorable information for similar reasoning. Consequently, the yield difference (by the signalling argument) predicts a positive association between the yield difference and the stock market's reaction.

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[8] This hypothesis is of no difference theoretically from Constantinides and Grundy's yield advantage argument, it is simply applied to a different issue. The name yield difference is used to indicate this different application.

2.2.3 The Free Cash Flow Hypothesis

Jensen (1986) advocates the "control function" of debt by postulating the free cash flow hypothesis. The free cash flow hypothesis emphasizes the agency problem between corporate managers and the shareholders. Jensen defines free cash flow as cash flow in excess of that required to fund all positive-NPV projects when discounted at the relevant cost of capital. Under the free cash flow hypothesis, managers have incentives to make their firms grow beyond the optimal size due to "biased" compensation schemes. Also, growth expands managers' power by increasing the resources under their control.

Because of such conflict of interest, managers may invest the free cash flow for a return under the cost of capital, or waste it on organizational inefficiencies. The promised interest payment on debt then constitutes an effective device in monitoring how managers utilize the free cash flows. Debt is superior than dividends in its role of monitoring due to its legally-binding characteristics. The free cash flow hypothesis recognizes this *imperfect* substitutability between debt and dividend, and the superiority of debt in monitoring. Hence, the Free cash flow hypothesis predicts a positive (negative) market response for equity following a corporate action increasing (decreasing) financial leverage (and consequently, the interest payout). Also, such response should be related to the size of free cash flows. Specifically, when a cross section of firms announce an activity reducing financial leverage, ceteris paribus, the equity value should drop more for the ones leaving the managers with higher free cash flows after the activity.

The Free cash flow hypothesis has not been applied to the call announcements of convertible debt before this study. When a firm calls to force conversion, it substitutes interest for dividends, and the monitoring role is eliminated through the call. Hence, the difference between the (after-tax) interest and the dividends may be viewed as free cash flows to the firm. The Free cash flow hypothesis predicts a *negative* association between the size of free cash flows and the market's reaction, i.e., firms release higher free cash flow through the call should experience more negative response than those do lower free cash flows. The proxy for free cash flows is the yield difference on the convertible bonds.

2.2.4 The Financial Distress Hypothesis

The last hypothesis is based on costs of financial distress. Jaffee and Shleifer (1990) predict a direct association between the degree of financial distress and call delay. More specifically, firms with poorer financial status should delay the call longer to avoid financial distress from failed conversions. Recall that the source of financial distress in Jaffee and Shleifer arises when the stock price of the calling falls suddenly during the notice period. If such sudden decrease in stock price drives the bond out-of-the-money, the conversions fails. The firm then needs to raise new funds in a short time to meet the redemption. This sudden need for new capital may create financial distress to the calling firm. Ceteris paribus, already high-leveraged firms are more vulnerable to financial distress because of the higher cost of raising new capital in short notice.[9]

2.2.5 The Risk-Averse Investment Banker Hypothesis

Jaffee and Shleifer (1990) believe that the standby-contract schemes do not resolve all the uncertainty facing the firm. They contend that the investment banker is also risk-averse. Since the fulfillment of a standard contract involves a small probability of large loss to the bank writing the contract, the risk-averse investment banker dictates call delay until the bond is deep in-the-money. They maintain that such risk aversion has much to do with the reputation at stake of the incumbent loan officials through "interviews of investment bankers . . . at Goldman, Sachs, and Salomon Brothers." (page S117, footnote 4). As a result, the above position predicts that the presence of a standby purchasing agreement should have little impact on the magnitude of call delay.

2.2.6 Other Hypotheses Related to Call Underwriting

CNS (1991) examine the use of an underwriter in convertible bond calls based on two theories: the agency-cost hypothesis and the shareholder-wealth-maximization hypothesis. Two possibilities exist under the agency-cost hypothesis. First, Smith (1977) suggests that managers and underwriters may collude to benefit themselves at the expense of shareholders. Second, risk-averse managers rely on underwriters in reducing personal risk (Amihud and Lev) (1981). As a result, the use of an underwriter would indicate a conflict between the interests of managers and shareholders. Therefore, the agency-cost hypothesis provides grounds for more negative stock market reaction to underwritten calls.

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[9] The higher cost can mean higher interest in the case of debt, or higher floatation cost (spread) and/or possible underpricing in the case of equity.

The shareholder-wealth-maximization hypothesis relies on the notion that managers always attempt to maximize shareholder wealth. Managers use an underwriter (equivalent to purchasing an insurance policy) only when the benefits thereof outweigh the costs. The shareholder-wealth-maximization hypothesis thus predicts a more positive stock market reaction for underwritten calls than non-underwritten calls.

The primary research result of CNS (negative stock market reaction to underwritten calls; neutral reaction to non-underwritten calls) appears to be consistent with the prediction of the agency-cost hypothesis. However, CNS test the agency-cost hypothesis by examining the fee paid to the underwriters, and find that the maximum fee is on average 0.28% of the market value of equity. Thus, CNS conclude that the direct costs of using underwriters can "explain only a small portion" of the negative average stock's market reaction to underwritten calls (page 193).

Therefore, the empirical result in CNS does not support either of the two hypotheses. CNS then rationalize their result by resorting to the theory of Harris and Raviv (1985), a hypothesis that was not tested. While no other theory is available for the use of underwriters, this dissertation examines the characteristics of firms using underwriters and are compared to those of firms who do not.

2.2.7 Summary of Hypotheses

Of the first four hypotheses, only the information/signalling hypothesis was tested, namely, by Ofer and Natarajan (1987). The problems with Ofer and Natarajan are discussed in Section 2.1. This dissertation re-examines the information/signalling hypothesis with better data, more solid theoretical grounds, and more consistent methods, thus expecting to make improvements on the results of existing studies. The free cash flow, the yield difference, and the financial distress hypotheses have never been tested. Testing of these three hypothesis adds new empirical results to the literature.

The stock market's reaction to underwritten calls was examined by CNS (1991). However, the "source" of the more negative market reaction to underwritten calls remains a puzzle, as it was not examined in CNS. This dissertation examines the post-call corporate financial performance to see if financial performance is consistent with the market's reaction, which should shed some light on the source of the more negative market reaction to underwritten calls.

These hypotheses about the stock market's reaction to calls of convertible bonds will be jointly tested by the following regression equation.

$$CAR_j = \alpha_j + \beta_1 \Delta G_{j,k} + \beta_2 UND_j + \beta_3 dYIELD_j + \beta_4 PRM_j + \epsilon_j \qquad (1)$$

where the left-hand-side variables, CAR_j, is the measure of the stock market's reaction, normalized by its standard deviation. The right-hand-side variables, in the order from left to right, are the proxies for the information hypothesis (ΔG), the underwriter (*UND*), the yield difference hypothesis and the free cash flow hypotheses (*dYIELD*), and the financial distress hypothesis (the last 4 variables). These variables are described in detail in Section 3.3. Equation (1) has not been tested in the literature.

CHAPTER 3
DATA AND METHODOLOGY

3.1 Sample Selection Procedures

The sample consists of convertible bond calls listed in Standard and Poor's *Bond Guide* from 1978 to 1989 meeting the following criteria: (1) The common stocks of the calling companies are listed on NYSE or AMEX. (2) Call announcements are reported on the *Wall Street Journal (WSJ)*. (3) No other corporate news is reported during days -3 through +1 relative to the call announcement date (day 0). (4) Daily stock return is available from the Center for Research in Security Prices' Daily NYSE/AMEX Combined File (known as the CRSP Tape). (5) Corporate financial information is available from *COMPUSTAT*. Table 1 summarizes the sample selection procedure. The final sample has 91 calls.

3.2 Methodology

3.2.1 Common Stock Abnormal Returns

The bulk of this study examines the impact of call announcement of convertible bonds upon the wealth of common shareholders. Standard "event study" technique is employed. The technique is described in detail shortly. In brief, this research technique is able to measure the firm's stock reaction to the call announcement and adjust it for market-wide movements and for the risk of the individual stock. The output of this process is the "cumulative abnormal return", or "*CAR*", which is widely regarded as the best measure of the market's reaction to a particular event.

The event study technique begins with a regression estimate of the following single-factor market model:[1]

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \epsilon_{jt}, \tag{2}$$

where R_{jt} is the rate of return of the common stock of the j^{th} firm on day t; R_{mt} is the rate of return of a market index on day t; ε_{jt} is a residual term that, by its characteristics, has an expected value of zero, and is assumed uncorrelated with R_{mt}, uncorrelated with $R_{kt,\, k\neq j}$, not autocorrelated, and not heteroscedastic. Beta (β) is a parameter that measures the sensitivity of R_{jt} to the market index. The *abnormal return* for the common stock of the j^{th} firm on day t as

$$AR_{jt} = R_{jt} - (\hat{\alpha}_j + \hat{\beta}_j R_{mt}), \tag{3}$$

where the coefficients $\hat{\alpha}_j$ and $\hat{\beta}_j$ are ordinary least squares estimates of α_j and β_j. To estimate Equation (2), the returns of the firms in the sample, as well as the returns of the value-weighted, dividend-included market index are taken from the *CRSP* file described earlier.

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[1] See Fama (1968) and Fama (1973) for a derivation and excellent discussion of this model.

Table 3: Sample Selection and Elimination Criteria for Calls of Convertible Debentures from 1978-1989

Criterion	Sample Size
Initial sample of calls by NYSE or AMEX listed firms from Standard and Poor's *Bond Guide*	338
Less: Calls not reported on the *Wall Street Journal*	170
Calls excluded because other corporate news appears during days -3 through +1	61
Excluded because daily stock return is not available from the *CRSP* tapes	9
Excluded because information of financial statement is not available from *COMPUSTAT*	7
Final sample size	91

Table 4: Final Sample of Convertible Debentures Calls by Year

Years	Calls
1978	5
1979	7
1980	13
1981	4
1982	6
1983	16
1984	4
1985	9
1986	16
1987	8
1988	0
1989	3
Total	91

To estimate α_j and β_j, 255 trading days of returns following the call announcements (from day +2 to day +266)[2] are used in the estimate process. The use of post-call data is to avoid a bias inherent in such estimate process. This bias arises because a (sometimes substantial) rise in stock price since its issuance is necessary for a successful forced conversion initiated by the call. This is equivalent to saying that the "normal return" in Equation (3) is very likely to be biased upward when estimated from the prior-to-the-call data, the result is downward bias in the abnormal return.[3]

Then, the 2-day *cumulative abnormal return (CAR)* is computed for each firm in the sample. It is the sum of the two *AR*s on the call announcement day and the day before (i.e., day -1 and day 0). The 2-day cumulative abnormal return is the dependent variable in Equation (1) discussed earlier.

3.2.2 Test of the Information-Signalling Hypothesis

As discussed in Section 2.2.1, the information-signalling hypothesis is actually the combination of two separate hypotheses, the information hypothesis and the signalling hypothesis. The information hypothesis postulates that convertible calls are motivated by unfavorable prospects of the call-announcing firm. According to the signalling hypothesis, the market perceives the call as a signal of negative news of the firm and reacts negatively when the call is announced. In Harris and Raviv (1985), the information and the signalling hypotheses are considered *simultaneously* and an equilibrium exists.

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[2] The reason that the day +1 figure is not used as it was by several studies is because one firm in the sample made some revision on the terms of the call on day +1.

[3] See Mikkelson (1981), and especially, Campbell Ederington, and Vankudre (1991) for an argument of this point.

Ofer and Natarajan test the information-signalling hypothesis by evaluating corporate performance after the call, and *separately,* the stock market's reaction. A direct link between the market's reaction and the post-call financial performance for the same company is absent. Therefore in essence, Ofer and Natarajan did not test the information-signalling hypothesis the exact way laid out in Harris and Raviv.

This dissertation attempts to improve on this. First, the financial performance after the call and the market's reaction are calculated respectively. Then, another test is run to search for the link between post-call financial performance and the stock market's reaction. The result of this test should clarify whether the call decision is motivated by negative private information, and whether this information is fully reflected in the stock price when the call is announced. Such a test has not been done in the literature.

The proxy for corporate performance is income *growth.* This study examines the income growth of the companies calling their convertible bonds for a period of four years after the call year relative to the period of the same length before the call year. Income growth is defined as change of income from the immediate previous year. For instance, if a company's income is measured at 12 percent in year t, and 10 percent in the year t-1, then the income growth for year t is 2 percent.

Ofer and Natarajan use these measures of income growth: earnings before interest and taxes (EBIT), earnings before taxes (EBT), and earnings per share (EPS). Of these three measures, EBIT is not affected by the conversion, EBT is affected by the reduction in interest payment, and EPS is affected by both the reduction in interest payment and the increase number of shares outstanding. To avoid these "side effects" associated with the conversion, the following measures of income growth are adopted.

(1) operating margin before depreciation (OMBD),

(2) return on average assets (ROA), and

(3) return on average investment (ROI).

The procedure for measuring income growth can be described clearly by the following equations. Let t=0 be the call year, Equation (1) defines income growth.

$$\Delta \pi_{j,k,t} = \pi_{jk,t} - \pi_{jk,t-1}, \tag{4}$$

where j is from 1 to 91, $k = \{1,2,3\}$, $t = \{4,3,2,-4,-3,-2\}$.

In Equation (4), π is the income proxy, Δ denotes "change" or the growth, subscripts j denotes the 91 companies in the sample, t the year, and k the three income measures. Since this study examines income growth for the four years before and four years after the call year with the call year excluded, there are 3 observations of income growth changes before and after the call respectively. The same procedure is repeated for each of the three income measures. Then, the *mean income growth* (denoted by $\Delta\bar{\pi}$) for before-the-call period is calculated by Equation (5). The after-the-call mean income growth is calculated the same way.

$$\Delta \bar{\pi}_k = \frac{1}{91} \frac{1}{3} \sum_j \sum_t \Delta \pi_{j,k,t}, \tag{5}$$

Finally, the proxy (denoted by ΔG) for the information-signalling hypothesis is calculated as the after-the-call mean income growth, minus the before-the-call mean income growth.

If Harris and Raviv are correct that the market perceives the call as an unfavorable signal and reacts negatively, corporate income growth must decline after the call to justify the unfavorable information. Moreover, the negative reaction should be consistent with the unexpected declines in income growth. Table 5 reports the statistics of the three proxies for income growth, and the *t* statistics on the changes in income growth.

The statistics in Table 5 reveal that firms calling convertible bonds did experience lower income growth following the call relative to that prior to the call. When income is measured by *OMBD* or *ROA*, the *t* statistics on the income change are significant at the 0.01 level. This finding is consistent with the theory of Harris and Raviv (1985) and the empirical evidence presented in Ofer and Natarajan (1987), provided that the call decision is independent from other decisions affecting the capital structure. This subject of "call decision independence" is further explored in the next chapter.

3.2.3 Test of the Yield Difference and the Free Cash Flow Hypotheses

The proxy these two hypotheses is the yield different on a convertible bond. The yield difference (denoted by *dYIELD)* is defined as

$$dYIELD_j = I_j(1-t_{cj}) - D_j, \tag{6}$$

where subscript *j* denotes the j^{th} firm in the sample, *I* is the annual interest expense per

Table 5: Average Income Growth 1 Year Prior to and After the Call Year

measures of income growth rate	percentage change in average income growth in the 4-year period after the call year (standard deviation in parenthesis) - Group 1	percentage change in average income growth in the 4-year period prior to the call year (standard deviation in parenthesis) - Group 2	*t* statistic+ on the difference between the 2 groups
operating margin before depreciation (OMBD)	-1.9106 (4.973)	0.8479 (2.6622)	-3.34*
return on average assets (ROA)	-1.7718 (5.0513)	0.3081 (2.1672)	-2.73*
return on average investment (ROI).	-2.5041 (21.173)	0.4112 (3.019)	-1.13

* Significant at the 0.01 level

+ Assuming normal distribution and that the population variance of the two groups (i.e., income growth before and after the call) are identical, the t-statistic is

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}, \qquad S^2 = \frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}$$

where $\bar{X}_1$, $\bar{X}_2$ and n_1, n_2 are the mean and sample size for the first and second groups, respectively. S is the "pooled" standard deviation of the two group.

bond, t_c is the applicable corporate tax rate,[4] and D is the annualized dividend (based on the last dividend) paid on stock worth the face value of one bond[5] ($1,000 in most cases) after the conversion. One minus t_c reflects the interest deductibility of debt. *DYIELD* is expressed as a percentage of the bond's face value. Coupon and dividend figures are obtained from the Standard and Poor's *Bond Guide.*

3.2.4 Test of the Financial Distress Hypothesis

Vulnerability to financial distress is measured by the pre-call financial leverage, the amount of liquid assets before the call, and how much capital to raise if the conversion fails. The level of financial leverage needs to be adjusted for variations among different industries. To this end, the 3-digit Standardized Industrial Code (known as the "*SIC*") is used to identify the industry. Then, a firm's pre-call debt level is "standardized" by dividing by its industrial median. This procedure gives the standing of the firm in its industry. However, the absolute financial leverage ratio is also important in cases where two or more firms have identical or similar standing in their industries. Firms with higher absolute financial leverage ratio, ceteris paribus, should be weighed more for higher costs of financial distress. Therefore, an interaction term of the relative financial leverage to the industrial median and the absolute financial leverage is used to capture the full effect of potential financial distress may have on the call decision and timing.

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[4] The corporate used is 46% through 1986, 34% thereafter.

[5] That is, dividend yield is calculated based on the face value of the bond rather than the market value of the stock.

Liquid assets are defined as including cash, marketable securities, and receivables. Then, liquid assets as a percentage of the dollar amount outstanding of the called convertible bond are calculated. The ability of obtaining new capital without paying a large "premium" is measured by the size (the annual sales for the year prior to the call) of the firm. *Pre-call* financial statement data come from the Standard and Poor's *COMPUSTAT* files. Industrial median figures are obtained from the following sources, *Ratio Studies* by Robert Morris Association, *Almanac of Business and Industrial Ratios* by Dr. Leo Troy, and *Industry Norms and Key Business Ratios* by Dun & Bradstreet Information Services.

The dollar amount of the convertible bond outstanding (scaled by total assets) at the time of the call may also be relevant since it determines how much capital to raise if the conversion fails. All the variables discussed above are added as explanatory variables.

If call premium is a good measure of call delay, it is also an indication of the cost of financial distress, provided that delaying the call is to avoid financial distress. Although not discussed by Jaffee and Shleifer, it is sensible that managers delay calls of convertible bonds longer the larger the potential costs of financial distress, i.e., corporations more vulnerable to financial distress tend to delay the call longer.

Call premium on a convertible bond is defined as the percentage the stock value of immediate conversion (the *conversion value*) exceeds the effective call price. The conversion value is computed as the stated conversion ratio multiplied by the stock price five trading day before the call. Let P be the effective call price, CV the conversion value, *PRM* the call premium, then *PRM = (CV-P)/P.* The stock price five trading days before the call announcement is arbitrarily selected as the bench-mark in computing the stock conversion value.

3.2.5 Test of the Risk-Averse Investment Banker Hypothesis

The main prediction under this hypothesis is that the employment of an underwriter does not allow the firm to call without delay due to the risk aversion of the investment banker. Hence, the presence of an underwriting contract should have little effect on the magnitude of call delay. As discussed earlier, call delay is measured by the call premium. The sample is then partitioned according to whether an underwriter is employed. The two partitioned samples are compared for any significant difference in call delay.

The financial distress theory in Jaffee and Shleifer's study does not have a direct implication on the market's reaction to call announcement; rather the study predicts a relation between financial distress and call delay. Nevertheless, it is interesting to examine whether call premium can be linked to the market's reaction. There are two possibilities. First, on an *ex ante* basis as portrayed in Jaffee and Shleifer (1990), the market may react more negatively to calls with a higher call premium since the obvious call delay may be the result of a more severe threat of financial distress to the firm.

On the opposite, the market may react more favorably to calls with a higher call premium on an *ex post* basis since a higher call premium greatly reduces the probability of a failed conversion. In the context of Jaffee and Shleifer, failed conversion results in financial distress. Hence, call premium is an independent variable in an attempt to explain the market's reaction. It is also a dependent variable in an effort to identify other variable which may affect call delay, as indicated by the following models [the first one is the same as Equation (1)]. Neither Equations (5) nor (6) has been tested in the literature.

$$CAR_j = \alpha_j + \beta_1 \Delta G_{j,k} + \beta_2 UND_j + \beta_3 dYIELD_j + \beta_4 (1 + PRM_j) + \epsilon_j \qquad (7)$$

$$PRM_j = \gamma_0 + \gamma_1 \left(\frac{LV_j}{\overline{LV}_j}\right)(LV_j) + \gamma_2 \left(\frac{LIQ_j}{OST_j}\right) + \gamma_3 \left(\frac{OST_j}{TA_j}\right) + \epsilon_j \qquad (8)$$

A list of the variables and their definitions can be found on the next page. The basic statistics for the major variables in the two models are provided in Table 6 (in Chapter 4). All variables are expressed in decimals in the regressions.

subscript j = the *jth* firm in the sample

CAR = the 2-day cumulative abnormal stock return;

ΔG_k = change in average income growth from before to after the call year, for the *kth* income growth measure;

UND = the underwriter dummy variable, 1 if there is an underwriter, 0 otherwise;

$dYIELD$ = the yield difference variable as defined in Equation (4);

LV = pre-call financial leverage (total debt over total assets);

$\overline{LV}$ = industrial median financial leverage (debt ratio);

LIQ = dollar amount of liquid assets;

OST = dollar amount outstanding of the convertible bond when called;

PRM = call premium; TA = a firm's total assets.

CHAPTER 4
RESEARCH RESULTS AND INTERPRETATIONS

Table 6 is a summary of the basic statistics of all the variables. The statistics reveal the following properties:

Firstly, market on the average reacts negatively to call announcements. Call announcements induce an 0.82% drop in equity prices. The 0.82% drop is not statistically significant when gauged by an appropriate test suggested by Patell (1976). Moreover, this figure is smaller than the -2% figure reported by Mikkelson.

Secondly, income growth slows down after the calls by all three income measures. The values of ΔG range from -2% to -3% for all three measures, indicating a 2 to 3 percent decline in income growth from the 4-year period before the call to that after the call.

Thirdly, the values of *dYIELD* are predominately positive with only 23 calls (25%) having negative yield difference. The mean value is 2.22%, indicating that the after-tax coupon is on the average higher than the dividend yield.

Fourthly, the average company in the sample announces the calls when there is a 43.38% call premium. This indicates a substantial delay of calling the bonds. The call premium figure is almost identical to Ingersoll's (1977).

Fifthly, the statistics for the three proxy variables of the financial distress hypothesis indicate only a mild degree of potential distress. The mean financial leverage

Table 6: Basic Statistics for the Major Variables

Variable	CAR	dYIELD	LV/$\overline{\text{LV}}$ +	LIQ/OST	OST/TA	PRM	UND
Mean	-0.0082	22.2207	1.118	3.7914	0.0717	1.4338	21 calls have an underwriter; 70 do not.
STD	0.0308	28.3026	0.2804	8.9634	0.0623	0.6017	
Maximum	0.0746	75.6	1.9928	61.9355	0.3	5.23	
Minimum	-0.1043	-54.5	0.4375	0.0132	0.0015	0.7829	

+ The "/" sign denotes "divided by".

for the firms in the sample is 11.8% higher than that of the comparative industrial average. Also, the unconvertible portion of the bond (in dollar value) is only an average of 7.17% of the total assets. However, the statistics also reveal apparent call delay indicated by the call premium. The average call premium is 41.8%, only 14 issues (15%) were called with a negative call premium (when the call price is less than the conversion value).

Lastly, another interesting statistic is that 12 calls (13%) were unable to force conversion, which means the firms need to redeem the bond in cash. These calls were identified with the conversion value being lower than the effective call price on the conversion expiration date, which is usually the last day in the notice period. Further examination on these 12 calls failed to convert indicates that only 1 call has a standby underwriter.

4.1 Interpretation of the Market's Reaction

The estimated coefficients of Equation (7) are reported in Table 7. The results in Table 7 indicate that all the independent variables combined have strong explanatory power with the *F* statistic significant at the 0.01 level and an adjusted R^2 of 11%, which is better than the 9% figure reported in CNS. Individually, all the variables except *UND* are significant. The standard errors of all the coefficients in all regressions are heteroskedastic-consistent, meaning that they were adjusted for heteroskedasticity.[1]

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[1] All the regression procedures are performed on *Times Series Processor* (*TSP*), version 4.2B.

The coefficient of change in income growth (ΔG as measured by *ROI*) has the best explanatory power[2] (highest *t* score). The positive sign associated with ΔG predicts a more favorable (unfavorable) market reaction the higher (lower) the average income growth after the call relative to that before the call. This result is strong evidence supporting the information/signalling hypothesis.[3] The *direct* link between the market's reaction and changes in income growth is therefore established. This direct link has not been documented in the literature.

The negative sign with *dYIELD*'s coefficient is of particular interest. The negative sign shows a more unfavorable market reaction to call announcement the greater the difference between coupon and dividend yields. From the perspective of the investors, this result is consistent with the free cash flow hypothesis but inconsistent with the yield difference hypothesis described in Chapter 2.

The positive sign with the coefficient of *PRM* indicates a more favorable price reaction on stock the higher the call premium (and the conversion is less likely to fail). This result is consistent with the financial distress hypothesis on an *ex post* sense. Firms delay call to avoid financial distress on an ex ante basis. However, the probability of experiencing financial distress is greatly reduced by building up the call premium as a buffer. The result here suggests that the market views the call premium on an ex post basis and reacts more favorably the higher the call premium since the conversion is more likely to succeed with a higher call premium.

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[2] Similar result is obtained when *ROA* is used in the regression. The coefficient of ΔG *(ROA)* is positive and significant at the 1% level. However, when *OMBD* is the measure, the coefficient is positive but insignificant.

[3] Nevertheless, the coefficient of ΔG is sensitive to how ΔG is calculated. In an unreported regression where ΔG is calculated as the different of the three income measures between the year after and the year before the call, the coefficient of ΔG is not significant while the coefficient of the other variables remain about the same.

The sign with the presence of an underwriter (*UND*) is negative, which is consistent with the finding of CNS (1991). However, the coefficient is not significant. The subject of call underwriting is examined further in the next section.

The results in Table 8 come form re-estimation of Equation (5) but only with calls of positive premium. Twelve calls with negative premium are excluded in the regression because these calls are probably made under "special" circumstances[4] (being an acquisition target, merger, spin-off and restructuring, etc.) where HR's theory does not apply.

The regression result with these 79 positive-premium calls is identical to that of Table 7 in the signs of prediction but results in better significance levels and a higher R^2. The result shown in Table 8 re-enforces the conclusions discussed earlier.

4.2 The Employment of an Underwriter

The presence of an underwriter (*UND*) appears to have some explanatory power (see Table 7). The negative coefficient association with *UND* predicts a more negative market reaction if an underwriter is present. The sign of coefficient is consistent with the finding of CNS (1991).

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[4] Indeed, examining the *WSJ Index* reveals the follows. Of the 12 calls with negative premium, 5 firms are potential takeover/merger candidates, 1 plans to spin off, 1 is restructuring, and 1 calls to refinance in the same year of the call.

Table 7: Result of Ordinary Least Square Estimate (91 firms)

Model: $CAR = \alpha + \beta_1 \Delta G + \beta_2 UND + \beta_3 dYIELD + \beta_4 PRM + \varepsilon$

Variable	Parameter Estimate	Standard Error	t statistic
Intercept	-0.011577	0.00739076	-1.566
ΔG (ROI)$^{+}$	0.000248808	0.0000798577	3.116**
UND	-0.011442	0.00784606	-1.458
dYIELD	-0.000225118	0.000102931	-2.187*
PRM	0.00817977	0.00413203	1.98*
	F statistic = 3.664**	$R^2 = 0.15$	adjusted $R^2 = 0.11$

* Significant at the 0.05 level
** Significant at the 0.01 level

$^{+}$ Similar result is obtained when *ROA* is used in the regression (i.e., the coefficient is positive and significant at the 0.01 level). When operating margin before depreciation (*OMBD*), is used, the coefficient is still positive but insignificant.

Table 8: Result of Ordinary Least Square Estimate (79 firms)

Model: $CAR = \alpha + \beta_1 \Delta G + \beta_2 UND + \beta_3 dYIELD + \beta_4 PRM + \varepsilon$

Variable	Parameter Estimate	Standard Error	t statistic
Intercept	-0.022474	0.00729794	-3.08**
ΔG (ROI)$^{+}$	0.000261152	0.000070	3.731**
UND	-0.00249198	0.00721024	-0.345617
dYIELD	-0.000221796	0.0000981925	-2.259*
PRM	0.012555	0.00445383	2.819**
	F statistic = 4.278**	$R^2 = 0.19$	adjusted $R^2 = 0.14$

* Significant at the 0.05 level
** Significant at the 0.01 level

$^{+}$ Similar result is obtained when *ROA* is used in the regression (i.e., the coefficient is positive and significant at the 0.01 level). When operating margin before depreciation (*OMBD*), is used, the coefficient is still positive but insignificant.

When the sample is divided into underwritten and non-underwritten calls, underwritten calls exhibit a 2-day abnormal return of -2% (a 2% drop), whereas non-underwritten calls show only a -0.5% equity return. The -2% is statistically different from zero at the 0.01 level by an appropriate test given in Patell (1976). On the other hand, -0.5% is not significant. These two results are similar to those reported in CNS.[5]

However, careful examination of the data reveals the following facts. Of the 12 calls that were going to fail in the conversion, only 1 call employed an underwriter. Therefore, out of the 21 call using an underwriter, only this 1 call relied on the underwriter to help convert the bonds. The other 20 calling companies choosing to pay a fee for an underwriter to force conversion did not utilize the service they paid for. Of course, this insight comes from an after-the-fact perspective.

On an ex ante basis, 10 of the 12 failed calls exhibit a negative call premium, i.e., the effective call price is higher than the conversion value at one week prior to the call announcement. However, only 1 of the 10 calls with an negative call premium was underwritten, the other 9 calls were not. Table 9 reports these interesting and revealing results.

The facts established by the statistics in Table 9 can be best summarized as follows. First, the call premium as of one week prior to the call is a good indicator on whether the conversion would be successful. Of the 78 calls with a positive call premium, only 3 calls failed in the conversion. However, 10 of the 12 calls with a

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[5] CNS report a 2% drop for underwritten calls and a .84% drop for non-underwritten calls.

Table 9: Relations Among Call Premium, Employment of an Underwriter, and Successful/Failed Conversion

	Successful conversions (79 calls)	Failed conversions (12 Calls)	No underwriter (70 calls)	Employed an underwriter (21 calls)
Number of calls with negative call premium (1 week before the call)	3	10	12	1
Average call premium of the group 1 week prior to the call (standard deviation)	0.4778 (0.6371)	0.0236 (0.3177)	0.46 (0.6976)	0.2777 (0.1981)
t statistics+	4.44**		1.18 (Not significant)	

** Significant at the 0.01 level

+ Assuming normal distribution and that the population variance of the two groups (i.e., income growth before and after the call) are identical, the t statistic is

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}, \quad S^2 = \frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}$$

where $\overline{X}_1$, $\overline{X}_2$ and n_1, n_2 are the mean and sample size for the groups of firms with and without an underwriter, respectively. S is the relevant standard deviation.

negative premium failed. Also, successfully converted calls display a much higher call premium than that of the failed calls (the *t* test value is significant at the 0.01 level). Second, most (20 out of 21) of the firms that employed an underwriter had a positive call premium (i.e., the forced conversion is "likely" to succeed, and the employment of an underwriter is likely unnecessary). Moreover, the average call premium of this group is not statistically different from the other group of calls that did not employ an underwriter.

Finally, Tables 10 and 11 report the difference in mean income growth between firms of underwritten and non-underwritten calls. The results in Tables 10 and 11 show no statistical difference in income growth between underwritten and non-underwritten calls in the 4-year period prior to and after the call year. In addition, mean income growth is positive for the 4-year period prior to the call for all three income growth measures, for both underwritten and non-underwritten calls. Mean income growth turns negative in the 4-year period after the call for all the three measures, and for both groups. Also, income growth after the call varies much more than prior to the call. Although the companies in the sample on average do worse after the call, there is no significant difference in mean income growth between underwritten and non-underwritten calls prior to or after the call.

The above findings conflict with the notion that new negative information exists and is revealed through the presence of an underwriter. As a result, the finding rejects the conclusion of CNS that employing an underwriter signals new negative information and causes equity price to decline. Rather, the above evidence suggests that employing an underwriter is unnecessary from either an ex ante or ex post perspective. Corporate

Table 10: Difference in the 4-Year Average Income Growth (in Percentage) Between Firms with and Without an Underwriter Prior to the Call

Income growth measures	Underwriter	Mean (Standard Deviation)	*t* statistic* of the difference in the two group+
OMBD	Yes	0.2946 (1.934)	-1.09
	No	1.0139 (2.83549)	
ROA	Yes	0.3169 (1.8676)	0.02
	No	0.3055 (2.2578)	
ROI	Yes	0.3244 (2.5354)	-0.15
	No	0.4372 (3.1658)	

* None of the t scores is significant.

+ Assuming normal distribution and that the population variance of the two groups (i.e., income growth before and after the call) are identical, the t statistic is

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}, \quad S^2 = \frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}$$

where $\overline{X}_1$, $\overline{X}_2$ and n_1, n_2 are the mean and sample size for the groups of firms with and without an underwriter, respectively. S is the relevant standard deviation.

Table 11: Difference in the 4-Year Average Income Growth in Percentage Between Firms with and Without an Underwriter After the Call

Income growth measures	Underwriter	Mean (Standard Deviation)	*t* statistic* of the difference in the two group+
OMBD	Yes	-0.8607 (5.3483)	1.11
	No	-2.2348 (4.8467)	
ROA	Yes	-0.777 (7.4832)	1.11
	No	-2.079 (4.0485)	
ROI	Yes	-1.1463 (9.5679)	0.33
	No	-2.9234 (23.68)	

* None of the t scores is significant.

+ Assuming normal distribution and that the population variance of the two groups (i.e., income growth before and after the call) are identical, the t statistic is

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}, \quad S^2 = \frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}$$

where $\overline{X}_1$, $\overline{X}_2$ and n_1, n_2 are the mean and sample size for the groups of firms with and without an underwriter, respectively. S is the relevant standard deviation.

resources could have been spared by not purchasing the unnecessary services. What we see here is a case of imprudent, or suboptimal managerial decision. The market penalizes the companies by reacting negatively in the stock price to reflect the decline in firm value as a result of imprudent managerial decisions.[6]

4.3 The Issue of Call Delay

To explicitly test whether potential financial distress affects call delay, Equation (8) where the call premium is the dependent variable is estimated. Plotting the observations of the call premium variable (*1+PRM*) indicates a non-linear distribution. To better accommodate the non-linearity of *PRM*, natural logarithm transformation is taken on *PRM* in the model. Firstly, all 91 calls were included in the estimate, the result is reported in Table 12. Calls of negative premium were excluded and the equation is re-estimated. Calls with negative premium are probably due to the special circumstances discussed earlier. These calls do not fit the financial distress scenario. Equation (8) is also estimated with positive-premium calls, the result is discussed shortly.

The high *F* statistic clearly indicates that the three independent variables explained a significant portion of the call premium (*PRM*). The coefficient with liquid assets scaled by the amount of bond outstanding (*LIQ/OST*) carries a positive sign, and is significant at the 0.05 level. The positive coefficient predicts that firms having more liquid assets delay the call longer (with a higher premium). This result conflicts with the financial distress hypothesis of Jaffee and Shleifer (1990) that predicts the opposite.

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[6] This conclusion is also consistent with, but not limited to, a notion provided by Smith (1977) where a collusion exists between corporate managers and the investment banker (the underwriter) to benefit themselves.

Table 12: Result of Ordinary Least Square Estimate (91 firms)

Model: $Log\ (PRM) = \gamma_0 + \gamma_1\ (OST/TA) + \gamma_2\ (LIQ/OST) + \gamma_3\ [(LV/\overline{LV})*LV] + \varepsilon$

Variable	Parameter Estimate	Standard Error	t statistic
Intercept	0.367815	0.073539	5.002^{***}
OST/TA	-0.120022	0.49689	-0.242
LIQ/OST	0.010932	0.0054292	2.014^{**}
$(LV/\overline{LV})*LV$	-0.132601	0.082123	-1.615^{*}
	F statistic = 3.692^{***}	$R^2 = 0.11$	adjusted $R^2 = 0.08$

* Significant at the 0.1 level
** Significant at the 0.05 level
*** Significant at the 0.01 level

The coefficient with the interaction term measuring the degree of financial leverage carries a negative sign, and is significant at the 0.1 level. The negative sign is of particular interest by predicting that the degree of financial leverage is reversely related to call delay: higher-leveraged firms call their convertible bonds with lesser delay. Other things equal, higher-leveraged firms call the bonds earlier than their lower-leveraged counterparts. This result again conflicts with the prediction of Jaffee and Shleifer but is consistent with the following scenario. Higher-leveraged firms call their bonds sooner to reduce their financial leverages, and to avoid the potential deadweight costs of distress imposed by the high financial leverage. Similar, low-leverage firms can afford to have their convertible bonds remained uncalled longer due to the unused financial leverage and lower probability (cost) of a financial distress.[7]

4.4 Is Convertible Bond Call an Independent Decision?

Another interesting issue that has not been examined in the literature is whether convertible bond call is an independent managerial decision. This issue has great implication on the "correctness" of the theories rationalizing the call decision. Close examination of the sample reveals that convertible bond call is not an independent or isolated corporate financing decision. Table 13 reports several events closely related to convertible bond calls. These events are identified through careful examination of *Directory of Corporate Financing.*

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[7] When the firms of negative call premium were excluded from the estimate, the coefficient with the interaction term measuring leverage is not significant, which constitutes further evidence inconsistence with Jaffee and Shleifer's prediction.

Table 13 shows clearly that 33 firms (represents 36% of the sample) took other actions affecting the capital structure close in time to the call announcement. For example, 13 firms with called convertibles also issued equity within 6 month before or after the call announcement. Sixteen firms refinanced by another issue of debt during the same time period. A calling firm floating another issue of straight or convertible debt before or after the call is obviously refinancing. If refinancing is the main concern for these firms, the call decision of the convertibles is at most a secondary issue.

On the other hand, a calling firm issuing common equity close to the call indicates the need of having more equity and possibly a lower debt ratio in the capital structure. However, it may also be the case that the firm sees a good timing to issue more equity due to favorable market conditions, which includes, but does not limit to, temporary overpricing on the firm's equity. Of course, the favorable market conditions may also be due to unfavorable private information about the firm.

Firms issuing equity within 6 months *before* the call has an interesting implication. If these firms issuing equity are indeed to capture favorable issuing price on their equity because of unfavorable insider information, the announcement of issuing common equity has an information effect as that described in Myers and Majluf (1984). This information effect by issuing equity may "take away" the information content revealed by the convertible call as described in Harris and Raviv. While only a few firms issued equity in the 6-month period prior to their convertible call announcements, the facts presented in Table 13 serve as a caveat to any theory (e.g., Harris and Raviv) that rationalizes convertible calls as an independent event from other capital structure decisions. Overall, the information in Table 13 indicates that the decision of calling a convertible bond is not an independent one, it depends upon other financing considerations of the firm. The research result presented in this chapter is summarized in Table 14.

Table 13: Number of Firms Taking "Related" Actions During
6 Month before and After the call

	During 6 months prior to the call announcement	During 6 months following the call announcement
Issued Common Stock	7	6
Issued Other Convertible Debt	5	4
Issued Straight Debt	4	3
Issued Convertible Preferred	2	1
Engaged in Debt Equity Swap	0	1

Table 14: Summary of Hypotheses, Proxies, the Predicted, and the Actual Signs of Coefficient of Estimation

Hypothesis	Proxy (Variable)	Coefficient	Predicted Sign	Actual Sign
Information-Signalling	Measure of firm's average change in income growth from 4 years before and after the call (ΔG)	β_1 (Equation 5)	+	+
Underwriter	Dummy variable, 1 if an underwriter is present, 0 otherwise (UND)	β_2 (Equation 5)	-	-
Yield Difference	Difference between the after-tax interest yield per bond and the dividend yield per bond (dYIELD)	β_3 (Equation 5)	+	-
Free cash Flow	Same as Yield Difference's	β_3 (Equation 5)	-	-
Financial Distress	Pre-call financial leverage divided by pre-call industrial median leverage ($LV/\overline{LV}$), interacted with the financial leverage ratio (LV)	γ_3 (Equation 6)	+	-
	Liquid Assets divided by amount outstanding when called (LIQ/OST)	γ_2 (Equation 6)	-	+
	Amount outstanding of the underlying convertible bond when called (OST), scaled by total assets of the firm	γ_1 (Equation 6)	+	-
	Measure of "delay" of call, the percentage by which the conversion value exceeds the effective call price (PRM)	β_4 (Equation 5)	+/-	+

CHAPTER 5
SUMMARY AND CONCLUSIONS

The research results may be summarized as follows. Three of the four variables explaining the market's reaction to convertible bond call are found significant. This study finds a positive association between market's reaction and changes in corporate income growth. However, this result is not robust for it is sensitive to the chosen method of computation for changes in income growth.

Moreover, this study finds that the difference between the after-tax coupon and the dividend (the yield difference) on a convertible bond is negatively related to the market's reaction, a result consistent with, but not limited to, the free cash flow hypothesis of Jensen (1986). This result has not been documented.

The result of testing the financial distress hypothesis by Jaffee and Shleifer is somewhat obscure. The proxy for financial leverage is found negatively related to call delay measured by the call premium. The (scaled) amount of liquid assets is found positively related to call delay. These two results are exactly the opposite of the predictions of Jaffee and Shleifer's financial distress theory. However, the negative association between the financial leverage proxy and call delay seems to suggest that convertible debt may serve as a "buffer" between straight debt and equity in corporate financing. Convertible debt offers two advantages to the issuing firm. First, through voluntary and/or forced conversion, the time span that convertible debt remains outstanding is generally shorter than that of a straight debt, thus reducing the *average* financial leverage. Second, convertible debt offers an alternative for corporations unwilling to issue equity in the fear of the negative equity price effect as described in Myers and Majluf (1984).

Though its coefficient is not significant in the regression model explaining the market's reaction, the presence of an underwriter does cause more unfavorable market response when the sample is partitioned. However, no evidence is found to support the "signalling content" of underwritten calls. No evidence can be found to support that firms employing an underwriter perform worse than the ones did not employ one. Careful examination of the data reveals that firms entering an underwriting contract are more likely to succeed in the conversion (and most of them indeed succeed), thus making the underwriting contract seemingly unnecessary and sub-optimal. This finding is conflicting with the explanation based on the signalling content of the underwriting contract given in CNS (1991). Rather, the evidence uncovered in this study attributes imprudent management to the cause of negative equity price reactions.

Finally, 33 out of the 91 firms (representing 36% of the firms) in the sample took one of the following actions affecting the capital structure close in time to the call announcement: issued common stock, issued other convertible debt, issued straight debt, issued convertible preferred, or engaged in debt equity swap. Hence, the evidence suggests that convertible debt call is not a totally independent capital structure decision, but rather only part of the complete corporate financing package.

Based on the research findings, this dissertation has made three major contributions to the finance literature. First, it identified three variables that significantly explain the market's reaction towards convertible debt announcements: a *direct* link between income growth changes and the market's reaction to support the information/signalling hypothesis, the difference in coupon and dividend to support the yield difference hypothesis, and the call premium to support the notion of potential financial distress on an *ex post* basis.

The second contribution is to link financial leverage to the timing of call, and call delay. This result provides evidence that calling convertible debt is one of the means to adjust the capital structure to a more desirable level.

The third contribution answers the question about the value of the standby underwriting contract. Evidence in this study suggests that firms entering an underwriting contract are more likely to succeed in the conversion, thus making the underwriting contract seemingly unnecessary and sub-optimal, which may explain the more negative equity price reaction on underwritten calls.

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BIOGRAPHICAL SKETCH

Charles Y. Mann was born in the Republic of China (better known as Taiwan) in 1963. He held a bachelor's and a master's degree in business administration before entering the University of Florida's Ph.D. program in finance in 1989.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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